

INFLUENCE OF INTERPHASE ON PHYSIC — MECHANICAL PROPERTIES OF PLASTIC COMPOUNDS

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ABSTRACT: The influence of dodecylbenzene sulfonic acid is inspected as a interphase by means of selected inorganic fillers (SiO_2 , Al_2O_3 a CaCO_3) in low density polyethylene with melt index 220 (BRALEN SA 220). By content 25% weig. SiO_2 as a filler, the tensile strenght is 7,39 Mpa, hardness 94,1 ShA and tensibility 3%. By content that goes up 0,1% weig. dodecylbenzene sulfonic acid, the tensile strenght increase to 8,86 Mpa, hardness 95,6 ShA and tensibility 5%. By another increasing, the content up to 0,5% weig., the tensile strenght and the hardness fall away and the tensibility stays on 5%. In case of Al_2O_3 , the content of dodecylbenzene sulfonic acid to 0,5% weig. do not change the tensile strenght, but the tensibility raises from 12% to 24–32%. In case of CaCO_3 , the content to 0,5% weig. dodecylbenzene sulfonic acid neither by using polyethyleneglykolphoshate neutralized with monoethanolamine has not improve the physic–mechanical properties. It shows a relevant influence of interphase with filler and matrix.

KEY WORDS: modification, filler, polymer matrix, interphase

1. INTRODUCTION

Incorporation of most of common fillers into the polymeric matrix is difficult, because of itselfs polaric character and on the other side because of nonpolaric character of polymeric matrix. And this is the reason for further modification of filler surface to more nonpolaric one. The filler surface could be changed by creation of interphase. The interphase consists of two different parts. The one which is close to filler has hydrofilic character and the one next to polymeric matrix has hydrofobic character. Interphase works as connecting element between those two different surfaces and creates transition environment between them. Interphase ensures higher tenacity limit and of course based on that better physical-mechanical compound properties.

Applies surface modifier:

- dodecylbenzene sulfonic acid - $\text{C}_{18}\text{H}_{31}\text{SO}_3\text{H}$
 - brown liquid
 - chemical compound with polaric part (group) and non-polaric alifatic chain

Dodecylbenzen sulfon acid was being observed acting as interphase on the surface of fillers and its influence to physical - mechanical properties was evaluated using the compounds of plastic LDPE. Following figures were observed:

- tensile strength
- tensile
- hardness

Formulations of plastic compound filled with modified and non-modified fillers:

Tab.1: Formulation of plastic compounds:

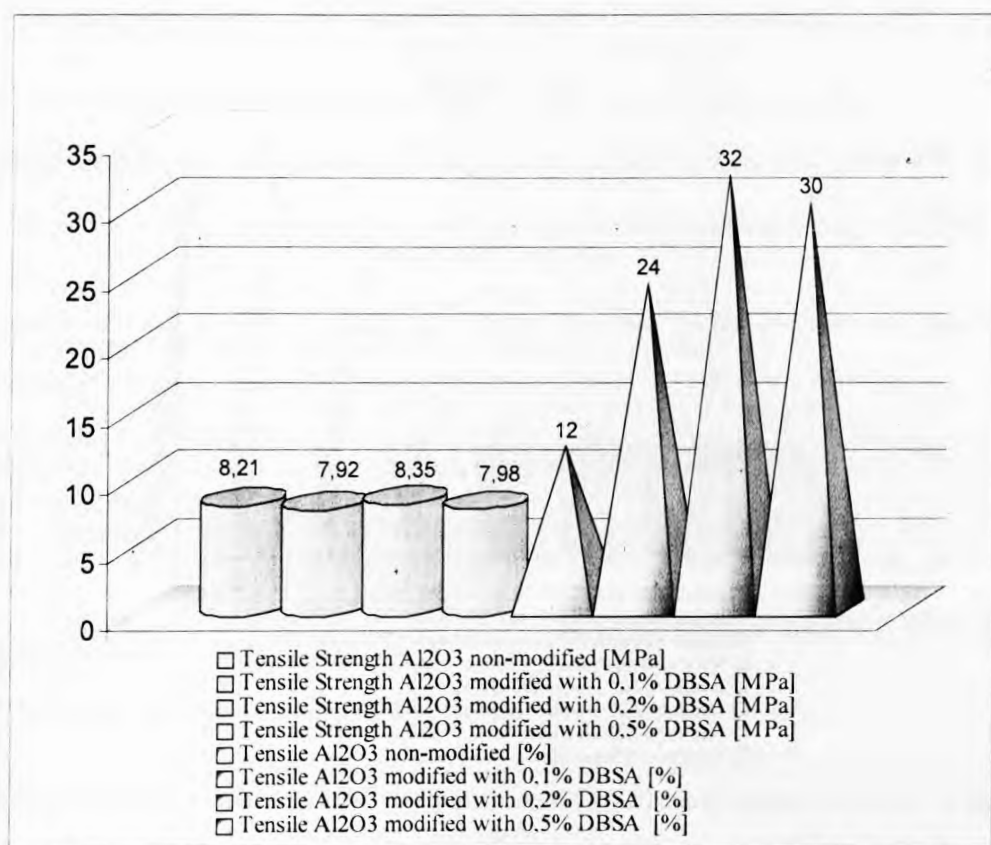
	filler characterisation	filler	PE
1	SiO ₂ non-modified	25% (weight)	75% (weight)
2	SiO ₂ modified with 0,1% DBSA	25% (weight)	75% (weight)
3	SiO ₂ modified with 0,2% DBSA	25% (weight)	75% (weight)
4	SiO ₂ modified with 0,5% DBSA	25% (weight)	75% (weight)
5	Al ₂ O ₃ non-modified	25% (weight)	75% (weight)
6	Al ₂ O ₃ modified with 0,1% DBSA	25% (weight)	75% (weight)
7	Al ₂ O ₃ modified with 0,2% DBSA	25% (weight)	75% (weight)
8	Al ₂ O ₃ modified with 0,5% DBSA	25% (weight)	75% (weight)

Compounds were prepared using Plasti-Corder Brabender with cavity volume of 70 cm³, with constant rpm of 70 per min. and temperature 120°C.

2. RESULTS

Tab.2: Physic-mechanical properties of plastic compounds filled with modified and non-modified SiO₂

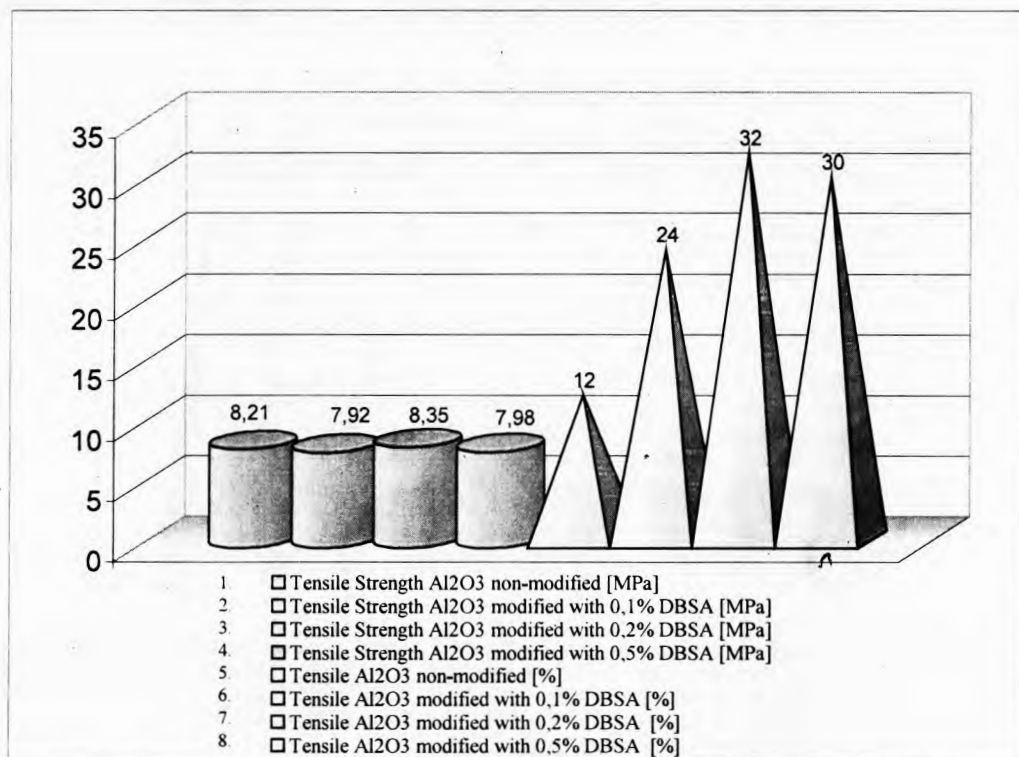
		Tensile Strength [MPa]	Tensile [%]	Hardness [ShA]
1	SiO ₂ non-modified	7,39	3	94,1
2	SiO ₂ modified with 0,1% DBSA	8,86	5	95,6
3	SiO ₂ modified with 0,2% DBSA	8,73	5	95,4
4	SiO ₂ modified with 0,5% DBSA	8,58	5	94,7



Graph 1: Physic-mechanical properties of plastic compounds filled with modified and non-modified SiO₂

Tab.3: Physic-mechanical properties of plastic compounds filled with modified and non-modified Al₂O₃ :

		Tensile Strength [MPa]	Tensile [%]	Hardness [ShA]
5	Al ₂ O ₃ čistý	8,21	12	90,7
6	Al ₂ O ₃ + 0,1% DBSA	7,92	24	95,6
7	Al ₂ O ₃ + 0,2% DBSA	8,35	32	94,6
8	Al ₂ O ₃ + 0,5% DBSA	7,98	30	91,8



Graph 2: Physic-mechanical properties of plastic compounds filled with modified and non -modified Al_2O_3

3. CONCLUSIONS

- using DBSA (dodecylbenzene sulfonic acid) as a interphase we have achieved the modification of filler surface and improve some physic-mechanical properties of filled plastic compounds.
- by modification of Al_2O_3 surface we have created a interphase which improved the tensile 2 – 3 times
- by modification of SiO_2 surface we have created a interphase which improved the tensile strength by cca 1,2 Mpa.

4. REFERENCES

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